The NASA SCI Files™

The Case of the Technical Knockout

Segment 3

Still undecided about what might have caused the GPS and radio glitches, the detectives contact Ole and Nina to meet Dr. D to learn about magnetism. Dr. D meets them at the Northern Lights Museum in Andenes, Norway, where he performs several demonstrations and discusses how the Earth's magnetic field interacts with light particles coming from the Sun. To learn more about electromagnets, the tree house detectives dial up Mr. Jacobsen's class at Andenes Ungdomskole (middle school). Last stop for the detectives is NASA Goddard Space Flight Center in Greenbelt, Maryland, where RJ and Catherine talk with Dr. Nicky Fox to learn more about our star, the Sun.

Objectives

Students will

- understand that opposite magnetic poles attract and like magnetic poles repel.
- observe a magnetic field around a bar magnet.
- understand that the Earth's magnetic field is similar to that of a bar magnet.
- construct an electromagnet and experiment with various voltages.
- describe the layers of the Earth's atmosphere
- label the layers of the Sun's atmosphere.
- understand how sunspots, solar flares, and coronal mass ejections occur on the surface of the Sun.

Vocabulary

aurora—a phenomenon occurring in the night sky around the polar regions, caused by atmospheric gases interacting with solar particles to create streamers, folds, or arches of colored light

convection—circulating movement in a liquid or gas, resulting from regions of different temperatures and different densities rising and falling in response to gravity

coronal mass ejection (CME)—huge bubble of gas threaded with magnetic field lines that are ejected from the Sun over the course of several hours. CMEs have the most energy of all solar events. They can disrupt the flow of the solar wind and produce disturbances that strike the Earth—sometimes with catastrophic results.

electromagnet—a temporary magnet formed when electric current flows though a wire or other conductor

ionosphere—a high layer of Earth's atmosphere, made up of ions that reflect radio waves

magnet—a piece of metal, often bar-shaped or U-shaped, that has the power to draw iron or steel objects toward it and to hold or move them

magnetic field—a region of space surrounding a magnetized body or current-carrying circuit in which the resulting magnetic force can be detected

magnetic poles—either of the two points at the end of a magnet where the magnet's field is most intense; either of the two regions on the Earth's surface near the geographic poles where the Earth's magnetic field is most intense

magnetosphere—the region surrounding Earth in which charged particles are trapped and affected by the Earth's magnetic field

mesosphere—the layer of the Earth's atmosphere in which temperature decreases rapidly, located between the stratosphere and thermosphere

plasma—a state of matter that is a hot, ionized gas made up of ions an electrons that are found in the Sun, stars, and fusion reactors

solar flare—a tremendous explosion on the surface of the Sun that releases energy in many forms

solar wind—the flow of high-speed ionized particles from the Sun's surface into interplanetary space

stratosphere—the region of the Earth's atmosphere located between the troposphere and mesosphere and in which the ozone layer is located

sunspot—one of the relatively cool, dark patches that appear in cycles on the Sun's surface and possess a powerful magnetic field

terrella—magnetized sphere used inside vacuum chambers, together with electron beams, to study the motion of fast-charged particles near the Earth

thermosphere—the region of the Earth's atmosphere above the mesosphere in which temperature steadily increases with height, beginning at about 85 km above the Earth's surface

travel bug—any small item that has been tagged with a unique tracking number and placed in a cache for geocachers to find

troposphere—the lowest layer of Earth's atmosphere, in which we live, and where clouds and weather occur

volt—unit of electric potential difference

voltage—a type of "pressure" that drives electrical charges through a circuit

Video Component

Implementation Strategy

The NASA SCI Files™ is designed to enhance and enrich existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Before viewing Segment 3 of *The Case of the Technical Knockout*, discuss the previous segment to review the problem and assess what the tree house detectives have learned thus far. Download a copy of the **Problem Board** from the NASA SCI Files™ web site, select **Educators**, and click on **Tools**. The **Problem Board** is also in the **Problem-Solving Tools** section of the latest online investigation. Have students use this section of the web site to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 2 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have occurred during previous segments. Use tools located on the Web, as was previously mentioned in Segment 1.
4. Review the list of ideas and additional questions that were created after viewing Segment 2.
5. Read the overview for Segment 3 and have students add any questions to their list that will help them better understand the problem.
6. **Focus Questions**—Print the questions from the **Educators** area of the web site ahead of time for students to copy into their science journals. Encourage students to take notes during the program so they will be able to answer the questions. An icon will appear when the answer is near.
7. **"What's Up?" Questions**—These questions at the end of the segment help students predict what actions the tree house detectives should take next in the investigation process and how the information learned will affect the case. You can print them from the **Educators** area of the web site ahead of time for students to copy into their science journals.

Careers

aerospace equipment scientist
atmospheric chemist
instrumentation engineer
solar astronomer
solar physicists
stellar physicist

View Segment 3 of the Video

For optimal educational benefit, view *The Case of the Technical Knockout* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. Have students reflect on the "What's Up?" Questions asked at the end of the segment.
2. Discuss the Focus Questions.
3. Have students work in small groups or as a class to discuss and list what they now know about orienteering, using a compass, GPS, satellites, the electromagnetic spectrum, electricity, magnets, auroras, and the Sun.
4. Organize the information, place it on the Problem Board, and determine whether any of the students' questions from the previous segments were answered.
5. Decide what additional information the tree house detectives need to determine what caused the GPS and radios to go on the blink. Have students conduct independent research or provide students with information as needed. Visit the NASA SCI Files™ web site for an additional list of resources for both students and educators.
6. Choose activities from the **Educator Guide** and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
7. For related activities from previous programs, download the corresponding **Educator Guide**(s). On the NASA SCI Files™ home page, click on the fence post for Guides. Click on the **Archives** tab and then click on the **2001–2002 Season**. To download the **guide**, click on **Full Guide** or the **Segment** indicated for *The Case of the Mysterious Red Light*.

   a. In the **Educator Guide** you will find

   a. Segment 4–*Layer Upon Layer* (atmospheric layers), *Layers of the Atmosphere* (atmospheric layers)

   Close the PDF window and return to the page for **Guides 2001-2002** Season. To download the guide, click on **Full Guide** or the **Segment** indicated for *The Case of the Phenomenal Weather.*

   a. In the **Educator Guide** you will find

   a. Segment 1 – *Convection to Perfection* (convection)

8. If time did not permit you to begin the web activity at the conclusion of Segments 1 or 2, refer to number 6 under **After Viewing** on page 15 and begin the PBL activity on the NASA SCI Files™ web site. If the web activity was begun, monitor students as they research within their selected roles, review criteria as needed, and encourage the use of the following portions of the online, PBL activity:
   - **Research Rack**—books, Internet sites, and research tools
   - **Problem-Solving Tools**—tools and strategies to help guide the problem-solving process.
   - **Dr. D's Lab**—interactive activities and simulations
   - **Media Zone**—interviews with experts from this segment
   - **Expert's Corner**—listing of Ask-an-Expert sites and biographies of experts featured in the broadcast
9. Have students write in their journals what they have learned from this segment and from their own experimentation and research. If needed, give students specific questions to reflect upon, as suggested on the PBL Facilitator Prompting Questions instructional tool found by selecting **Educators** on the web site.
10. Continue to assess the students' learning, as appropriate, by using their journal writings, problem logs, scientific investigation logs, and other tools found on the web site. Visit the **Research Rack** in the Tree House and find the online PBL investigation main menu section, **Problem-Solving Tools**, and the **Tools** section of the **Educators** area for more assessment ideas and tools.

Resources *(additional resources located on web site)*

Books

Akasofu, Syun-Ichi: *Secrets of the Aurora Borealis*. Alaska Geographic Society, 2002, ISBN: 1566610583.

Apt, Jay and Michael Helfert: *Orbit: NASA Astronauts Photograph the Earth*. National Geographic Society, 2003, ISBN: 0792261860.

Baylor, Byrd: *The WayTo Start a Day*. Simon and Schuster, 1986, ISBN: 0689710542.

Burke, Christopher: *Magnetism*. Gareth Stevens Audio, 2003, ISBN: 0836833600.

Carmi, Rebecca and Judith Stamper: *Amazing Magnetism*. Scholastic, Inc., 2002, ISBN: 0439314321.

Cooper, Christopher: *Magnetism: From Pole to Pole.* Heinemann Library, 2003, ISBN: 1403435510.

Esbensen, Barbara Juster: *Night Rainbow*. Scholastic, Inc., 2000, ISBN: 053130244X.

Freeman, John: *Storms in Space*. Cambridge University Press, 2001, ISBN: 0521660386.

Hall, Calvin: *Northern Lights: The Science, Myth, and Wonder of Aurora Borealis*. Sasquatch Books, 2001, ISBN: 1570612900.

Kinsey-Warnock, Natalie: *Fiddler of the Northern Lights*. Dutton Juvenile, 1996, ISBN: 0525652159.

Kosek, Jane Kelly: *What's Inside the Sun?* Rosen Publishing, 2003, ISBN: 0823952797.

Nicolson, Cynthia Pratt: *The Sun*. Kids Can Press, Limited, 1997, ISBN: 1550741586.

Simon, Seymour: *The Sun*. William Morrow and Company, 1990, ISBN: 0688092365.

Vogt, Gregory: *Sun*. Capstone Press, 2000, ISBN: 0736805168.

Whitethorne, Baje: *Sunpainters: Eclipse of the Navajo Sun*. Salina Bookshelf, 2002, ISBN: 1893354334.

Ytter, Harald and Torbjorn Lovgren: *Aurora: the Northern Lights in Mythology, History, and Science*. Bell Pond Books, 1999, ISBN: 0863152872.

Video

NASA CONNECT™: *Dancing in the Night Sky*
Grades 6–12

NASA CONNECT™: *Solar Flares*
Grades 6–12

Discovery Channel School: *Savage Sun*
Grades 6–12

Disney: *Atmosphere (Bill Nye, the Science Guy)*
Grades 3–8

Disney: *Magnetism (Bill Nye, the Science Guy)*
Grades 3–8

Schlessinger Media: *All about the Sun (Space Science for Children)*
Grades K–4

Schlessinger Media: *Earth's Atmosphere (Space Science in Action)*
Grades 5–8

Schlessinger Media: *Electromagnetic Energy (Energy in Action)*
Grades 5–8

Web Sites

NASA CONNECT™
Educators, visit this site to find video and lessons on auroras and solar flares.
http://connect.larc.nasa.gov

NASA: 3-D Images of Coronal Mass Ejections
NASA funded scientists created the first three-dimensional (3-D) view of massive solar eruptions called Coronal Mass Ejections (CMEs). Visit this site to see some awesome images and learn more about how the images will help researchers around the world.
http://www.nasa.gov/centers/goddard/news/topstory/2004/07023dcme.html

NASA Imagers: The Adventures of Echo the Bat
This NASA interactive web site for children features a multimedia adventure game that teaches facts about light and the electromagnetic spectrum. Also choose a downloadable book and web activities for children to try.
http://imagers.gsfc.nasa.gov/echohome.html

NASA: Polar Cap History
Here you can read all about how auroras were studied and analyzed throughout modern history. See a picture of Dr. Kristian Birkeland and his terrella and find more information on his theory.

NASA: Coronal Mass Ejections
Learn more about coronal mass ejections (CME) and view some awesome photos.
http://science.nasa.gov/ssl/pad/solar/cmes.htm

NASA: Solar Flare
Discover facts about solar flares and the problems they can cause here on Earth.
http://science.msfc.nasa.gov/ssl/pad/solar/flares.htm

NASA: Sunspots
Learn all about sunspots and the sunspot cycle.
http://science.msfc.nasa.gov/ssl/pad/solar/feature1.htm#Sunspots

NASA Jet Propulsion Laboratory: Educator's Guide to Convection
Discover how convection works and learn more about convection cells on the Sun.
http://www.solarviews.com/eng/edu/convect.htm

Amazing Space
Find an interactive activity called "Star Light, Star Bright" that teaches about the electromagnetic spectrum.
http://amazing-space.stsci.edu/resources/explorations/

Exploratorium Solar Max
Check out the wonderful pictures and numerous links to find out more about the sun and sunspots.
http://www.exploratorium.edu/solarmax/index.html

Windows to the Universe
This web site uses diagrams to offer a simple explanation about the layers of the atmosphere.
http://www.windows.ucar.edu/tour/link=/earth/Atmosphere/layers.html

The Sun
On this University of Virginia web site, you can learn about the sun and watch actual footage of the sun, including the corona, sunspots, and eclipses.
http://www.astro.uva.nl/demo/sun/kaft.htm

The Sun
Find numerous pictures and a wealth of information about the sun.
http://www.nineplanets.org/sol.html

Surfing for Sunbeams
"Surf" this site for important facts about the sun and watch informative video that clarifies concepts from the web site.
http://www.lmsal.com/YPOP/Spotlight/Tour/index.html

Sunspots
Exploratorium's web site has detailed information about sunspots, including video and pictures to explain the phenomena.
http://www.exploratorium.edu/sunspots/index.html

Exploratorium Auroras
This web site explains what auroras are and shows beautiful pictures and a video of the northern lights.
http://www.exploratorium.edu/auroras/index.html

Auroras: Paintings in the Sky
Find out what auroras look like on Earth and from space. Learn how they are created and where you can find them.
http://www.exploratorium.edu/learning_studio/auroras/

The Aurora Page
See many pictures of auroras and find links to other aurora web sites.
http://www.geo.mtu.edu/weather/aurora/

NORDLYS – Northern Lights
Learn about the northern lights— what they are, where they are, and what they look like.
http://www.northern-lights.no/index.shtml

Activities and Worksheets

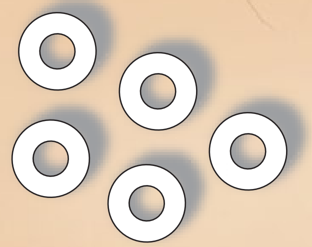
Let the Force Be With You

Segment 3

Purpose

To understand that magnets have positive and negative poles

To learn that similar poles repel and opposite poles attract

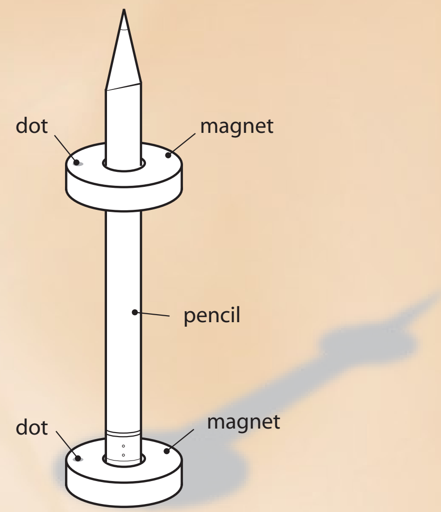


Materials

5 identical doughnut magnets
pencil
small dot stickers
science journal

Procedure

1. Bring two of the magnets near each other.
2. Turn one magnet until the other magnet attracts it. Let them come slowly together until they touch.
3. Rotate one of the magnets to find the position in which it is most strongly repelled by the first magnet.
4. In your science journal, describe what happened as you put the magnets together in the different positions.
5. Take any two of the five magnets and rotate them until they are attracted to each other and stick together.
6. Place a small dot sticker on the side of each of the magnets that stuck together.
7. Repeat with the other magnets until all are marked with stickers.
8. Place two magnets together with the dots facing each other.
9. In your science journal, record your observations.
10. Place two magnets together with the dots facing away from each other.
11. Record your observations.
12. When two objects push away from each other, scientists say that they repel. And when two objects stick together, scientists say that they attract. Complete the following data chart using the terms "repel" and "attract."
13. Slide one magnet, dot side up, onto a pencil.
14. Repeat sliding the remaining magnets onto the pencil with dot side up. See diagram.
15. Draw a picture in your science journal and describe what you observe. Explain in your own words what occurred and why.
16. Slide the magnets off the pencil.
17. Slide one magnet, dot side up, onto the pencil.
18. Slide the next magnet, dot side down, onto the pencil.
19. Continue sliding the magnets onto the pencil—dot side up, dot side down, and finally dot side up.
20. In your science journal, describe what you observed and illustrate. Explain in your own words what happened and why.



Let the Force Be With You

Segment 3

Conclusion

1. What happens when like poles come together? Why?
2. What happens when opposite poles come together? Why?
3. In your own words, explain why the magnets "floated" when they were placed on the pencil with opposite poles together.

Extension

1. Place two magnets on a pencil so that they float. Use a metric ruler to measure the distance between the two magnets. Add a third magnet so that it also floats. Measure the distance between the first two magnets again and also the second and third magnets. Continue adding magnets and measuring until all five magnets are floating. Describe what happened.
2. Research Peter Perigrinus who made spheres from naturally magnetic lodestones in 1269. Explain how lodestones find north.

Magnetizing the Field

Segment 3

Materials

bar magnet
iron filings
small, clear plastic box
science journal

Purpose

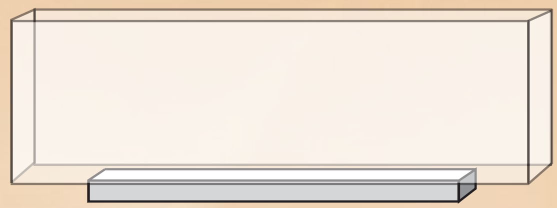
To observe the magnetic field around a bar magnet

Background

A magnet is surrounded by a magnetic field that exerts a magnetic force. When an object made of iron or another magnet is placed in the magnetic field, it reacts to the magnetic force. The magnetic field is strongest close to the magnet and weakest far away. Lines of force, or magnetic field lines, can represent the magnetic field.

Procedure

1. Place the bar magnet on a flat surface.
2. Place the small, clear plastic box on top of the bar magnet.
3. Sprinkle the iron filings in the box so that they cover the area in and around the bar magnet.
4. Tap the box gently to make the pattern appear more clearly.
5. Observe and record your observations in your science journal.
6. Draw a picture of the magnetic field lines created by the iron filings.



small clear box sitting on top of a magnet

Conclusion

1. Describe the pattern that the iron filings made around the bar magnet.

Extension

1. Try differently shaped magnets (such as round, square, or oval) and illustrate and describe their magnetic field lines.
2. Try different numbers of magnets in different arrangements and illustrate and describe the resulting magnetic field lines.

Now Showing in 3D

Segment 3

Purpose

To observe a magnetic field in 3D

Materials

magnet
extra-fine steel wool
small plastic bottle filled with baby oil
scissors
goggles

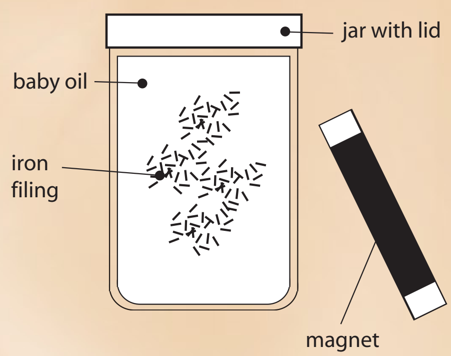
Teacher Note

Cow magnets work well with this experiment. Cow magnets are very strong magnets that you can purchase at a feed store or from scientific catalogs. If cow magnets are not available, substitute four or five donut magnets stacked upon each other or a very strong bar magnet.

Teacher Prep

For each group, either spray paint one side of a small plastic bottle or place a plain white label on one side. The white paint or label will help the students see the fibers better. Fill each bottle with baby oil almost to the top, leaving only a small space to add the fibers. Secure the cap of each bottle before dispensing to the groups.

Procedure



1. Wear goggles to protect your eyes from the steel wool pieces.
2. Unroll one end of the steel wool.
3. To trim evenly, use scissors to cut across the unrolled end of the steel wool. Discard the frayed fibers.
4. Cut across the steel wool, making very narrow cuts (2–3 mm wide).
5. Continue cutting until you have a little more than a teaspoon of fibers.
6. Gently wad the fibers (do not pack too tightly) and drop them into the bottle of baby oil.
7. Securely place the cap on the bottle and shake the bottle until the fibers are spread evenly throughout the oil.
8. While the fibers are still mixed in the oil, hold a magnet about 2–3 cm from one side of the bottle and observe the tiny fibers. It helps to hold the bottle in bright light to better see the fibers against the white portion of the bottle.
9. If the fibers start to settle to the bottom, just shake the bottle again. If the fibers clump against the magnet, you are holding the magnet too close to the bottle.
10. Vary the position of the magnet. For example, hold the magnet up and down, sideways, or with just one pole near the bottle.
11. Record your observations and illustrate each.

Now Showing in 3D

Segment 3

Conclusion

1. Explain in your own words why the iron filings lined up the way that they did.
2. Describe how the magnetic fields changed as you varied the position of the magnet.
3. What do you think creates a magnetic field?
4. What do you think the Earth's magnetic field looks like? Draw a picture.

Extension

Fill a small plastic soda bottle (remove label) about one-fifth full of iron filings. Place a cow magnet in a plastic test tube. The test tube should be about 75% fuel as long as the bottle is tall. To enlarge the size of the top of the test tube so it won't fall into the soda bottle, wrap the outer top rim of the test tube with masking tape. Also wrap masking tape over the top opening of the test tube. Place the test tube into the soda bottle, making sure it fits snugly. Add tape if needed. Put the bottle cap back onto the top of the bottle. Turn the bottle on its side and rotate. Watch what happens to the iron filings.

Electrifying Electricity

Segment 3

Problem

To build an electromagnet and to calculate the average number of paper clips lifted by using four different voltages

Background

A volt is a unit that measures the potential to move charges. The more voltage a battery has, the greater the electrical current. As the current increases in an electromagnet, the magnet's strength increases.

Teacher Prep

Use tape to label each of the four battery slots with the correct voltage: 1.5 V, 3.0 V, 4.5 V, and 6.0 V.

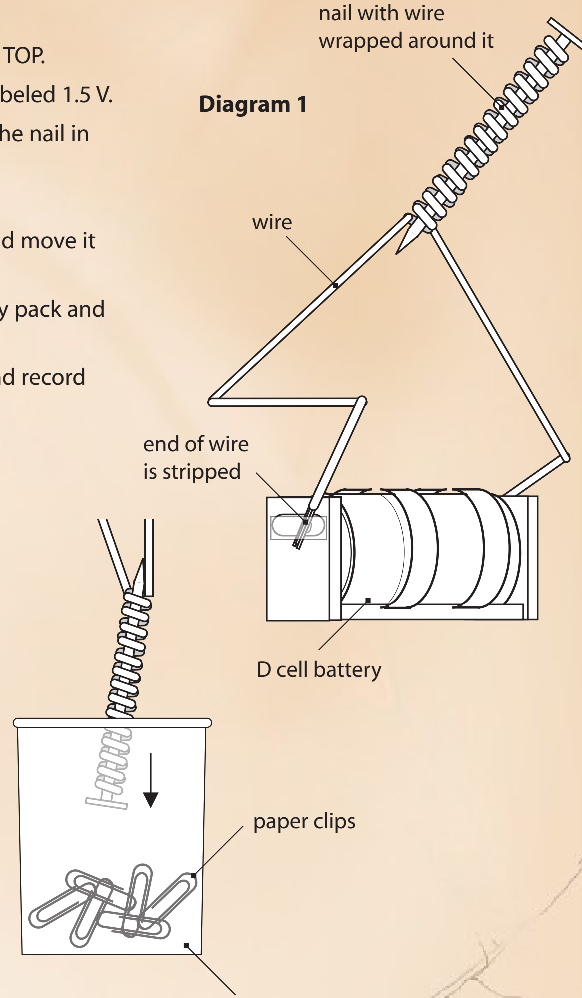
Materials

large iron nail (16 cm)
3-m insulated stranded copper wire (18 to 24 gauge)
four 1.5-volt D cell batteries
battery holder for 4 batteries
100 metal paper clips
small container for paper clips
alligator clips
Electromagnets Data Chart (p.53)
Electromagnets Results Graph (p. 53)

Procedure

1. Take the end of the wire that does not have an alligator clip and straighten it.
2. To construct your electromagnet, neatly wrap the straightened end of the wire around the nail 25 times. Start wrapping at the flat part (head) of the nail and work your way towards the nail's point.
3. Clip one end of the wire to the screw on the battery pack labeled TOP.
4. Hold the other end of the wire onto the metal near the voltage labeled 1.5 V.
5. Touch the wire to the metal screws and have your partner place the nail in the container of paper clips. See diagram 1.
6. Gently mix the paper clips with the electromagnet.
7. Carefully lift the electromagnet out of the paper clip container and move it to a clean spot on the table.
8. Turn the electromagnet off by removing the wire from the battery pack and let the paper clips fall.
9. Count the number of paper clips the electromagnet picked up and record the number in the Electromagnets Data Chart on page 53.
10. Repeat steps 4–9 for two more trials.
11. Repeat steps 4–10 with the other three voltages you used.
12. Average the number of paper clips for the three trials for each voltage.
13. Graph your results on the Electromagnets Results Graph.

Diagram 1



Conclusion

1. What happened to the electromagnet's strength when you added more volts?

Extension

Experiment with different numbers of wire wraps around the nail.

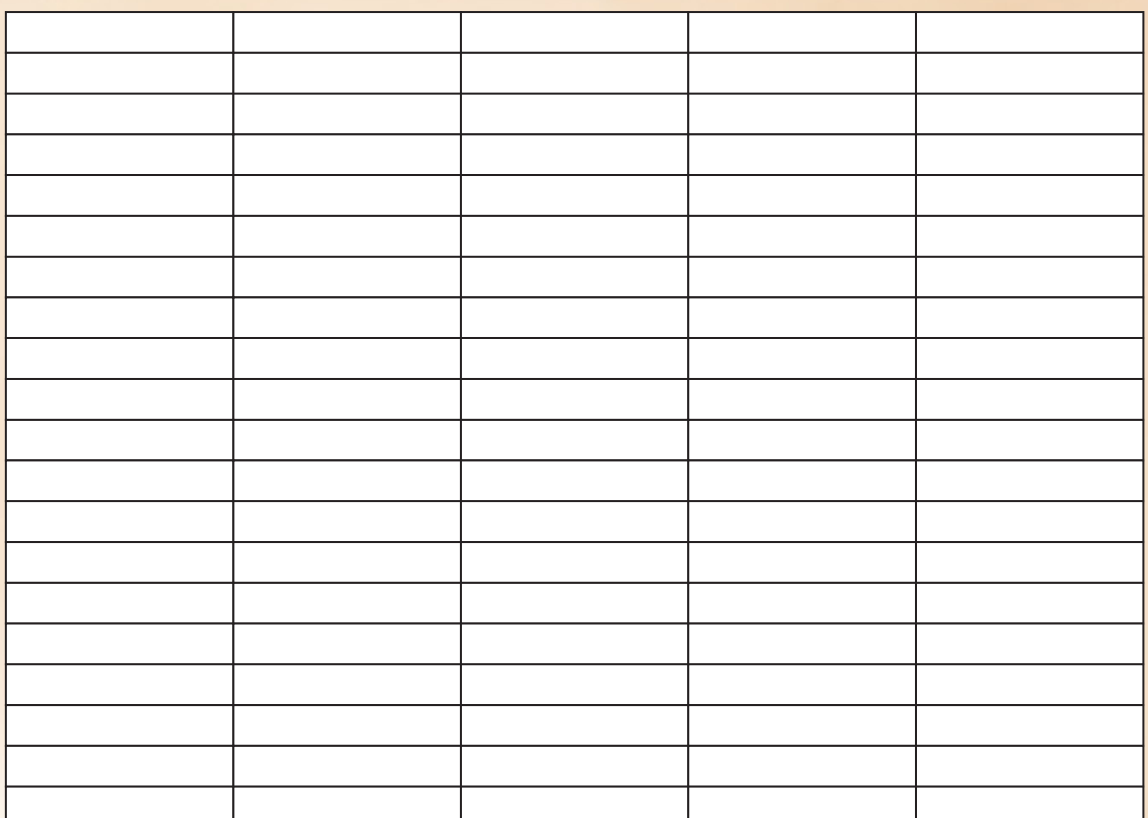
Electrifying Electricity

Segment 3

ELECTROMAGNETS DATA CHART

Battery Voltage	Paper Clips Trial 1	Paper Clips Trial 2	Paper Clips Trial 3	Average
1.5V				
3.0V				
4.5V				
6.0V				

ELECTROMAGNETS RESULTS GRAPH



0 1.5V 3.0V 4.5V 6.0V

The Sun's Layers

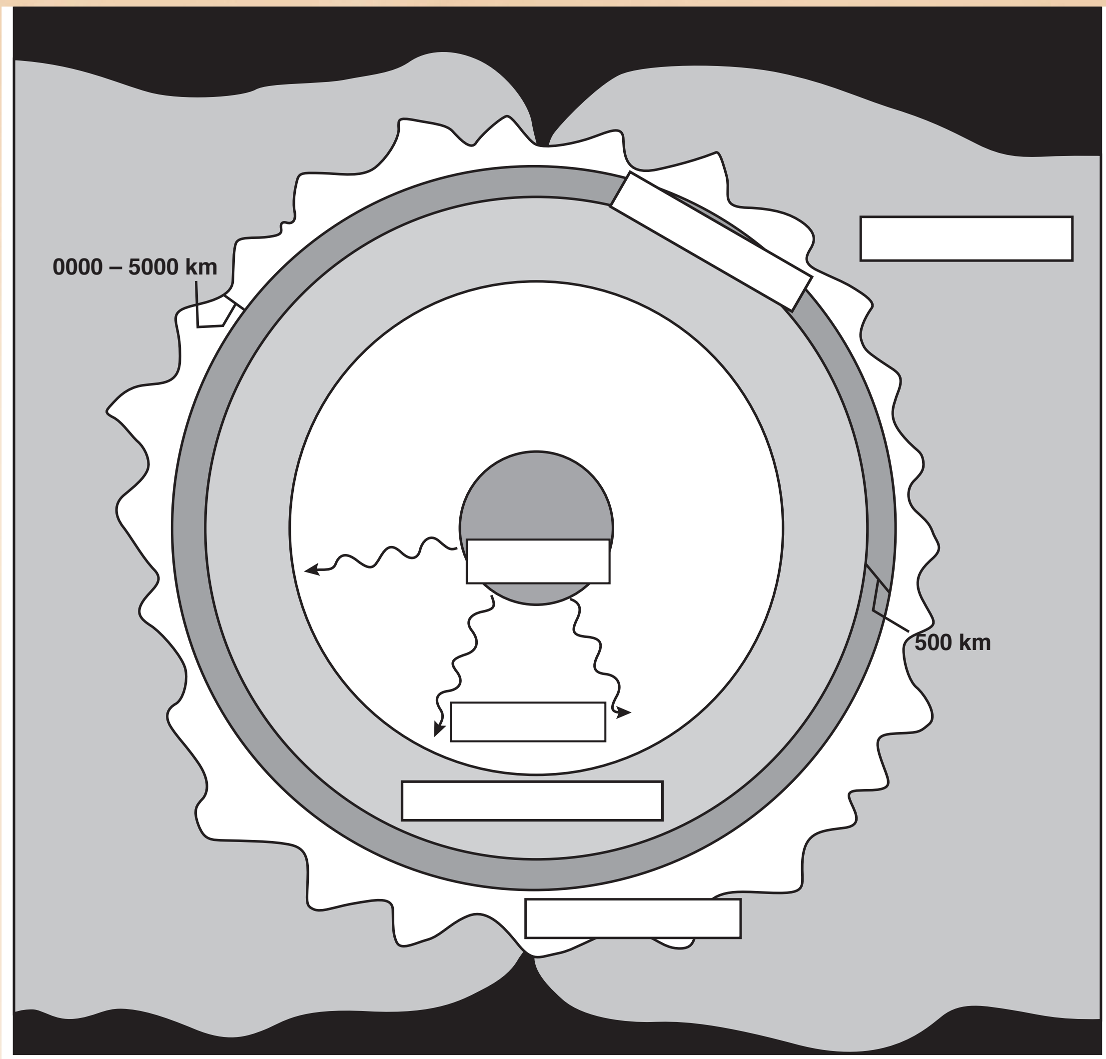
Segment 3

Purpose:

To label and describe the layers of the Sun.

Label the 4 inner layers and 2 outer layers of the Sun in the box for the layer you are labeling.
Use these vocabulary words:

Core	Radiation layer	Convection layer
Photosphere	Corona	Chromosphere



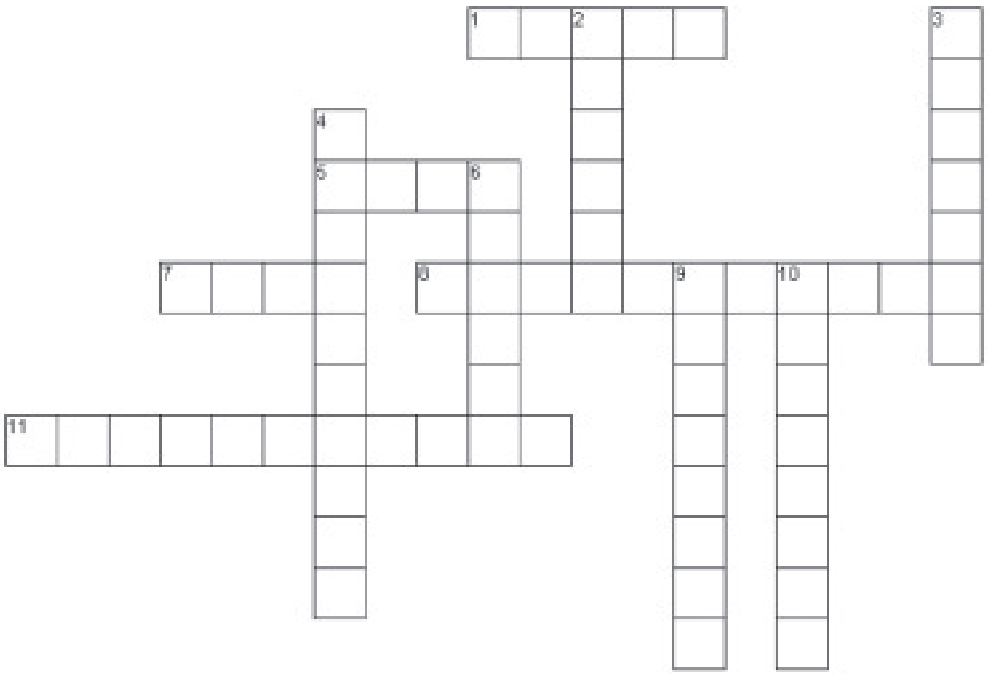
Extension

Conduct research to learn more about the various layers of the Sun. Create a poster, model, or written report describing what is known about each layer. In the show, Dr. Fox compared and contrasted the layers of the Sun to the layers of the Earth. Describe how they are similar and/or different.

Our Very Own Star

Segment 3

Use the word bank to help you complete the crossword puzzle.



ACROSS

1. Our Sun is a medium yellow________ star.
5. The Sun spins on its_______________.
7. The center of the Sun is the ___________.
8. The __________is the surface of the Sun.
11. The Sun gives off ________ rays.

DOWN

2. Sunspots can __________ the Earth's weather.
3. ___________ was the first scientist to observe and record sunspots.
4. We get valuable data about the Sun from ____________.
6. The Sun is in the shape of a ___________.
9. _____________ are irregularly shaped dark areas on the Sun.
10. The Sun is made up mainly of _________.

VOCABULARY

Ultraviolet
Photosphere
Core
Axis
Dwarf
Affect
Hydrogen
Sphere
Satellites
Gallileo
Sunspots

Answer Key

Segment 3

Let the Force Be With You

1. When like poles came together, they pushed away from each other because like poles always repel.
2. When opposite poles came together, they stuck to each other because opposite poles attract.
3. Answers will vary.

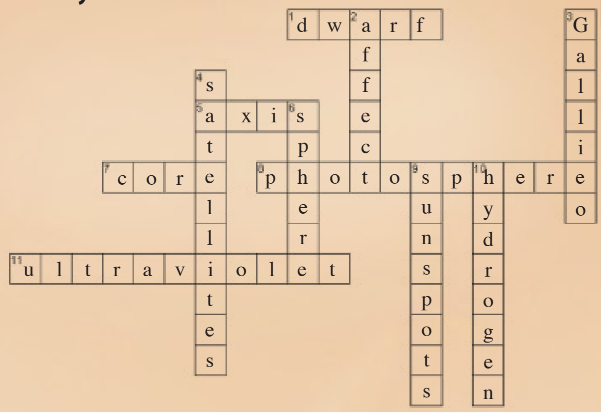
Magnetizing the Field

1. The iron filings should have made a pattern of lines coming from one pole and going to the other pole. Concentration of the iron filings is greatest at the poles.

Now Showing in 3D

1. Answers will vary, but might include that each iron filing became a tiny magnet with a north and south pole when you brought the magnet near them. The atoms in the iron aligned themselves with the magnetic field.
2. Answers will vary.
3. Motion of electrical charges. For example, the magnetic field of a bar magnet results from the motion of negatively charged electrons in the magnet.
4. Answers will vary, but hopefully students will understand that most magnetic fields are similar and that our Earth's magnetic field looks very similar to the one they created with the bar magnet. The origin of the Earth's magnetic field is not completely understood, but scientists think it is associated with electrical currents that are produced by the coupling of convective effects and the rotation, in the spinning liquid metallic outer core, of iron and nickel. This mechanism is called the dynamo effect.

Our Very Own Star



The Sun's Layers

1. Core
2. Photosphere
3. Radiation layer
4. Corona
5. Convection layer
6. Chromosphere